

**DEPARTMENT OF ENVIRONMENTAL QUALITY
PERMITTING and COMPLIANCE DIVISION
MONTANA POLLUTANT DISCHARGE ELIMINATION SYSTEM
(MPDES)**

Statement of Basis

Permittee:	City of Laurel
Permit No.:	MT0030261
Receiving Water:	Yellowstone River
Facility Information:	
Name	City of Laurel Wastewater Treatment Plant
Location	802 Sewer Plant Road
Facility Contact:	Tim Reiter, Chief Operator P.O. Box 10 Laurel, MT 59044 406-628-1987
Fee Information:	
Number of Outfalls	1 - (for fee determination)
Outfall – Type	001 - Process water

I. Permit Status

The MPDES permit for the City of Laurel Water Treatment Plant (WTP) was issued on February 1, 1996 and expired on September 30, 2000. The facility submitted a Short Form 2A application to renew the permit on April 24, 2000. The application was determined complete on April 24, 2000. An updated process flow diagram and additional information was requested from the facility on January 23, 2007 and received by the Department on January 29, 2007.

II. Facility Information

A. Facility Description

The City of Laurel WTP is a conventional potable water treatment plant utilizing settling, coagulation, flocculation and filtration processes to treat raw surface water from the Yellowstone River to finished drinking water. Approximately one (1) million gallons per day (mgd) of raw water is treated in the winter and about 3-3.5 mgd is treated in the summer. Aluminum sulfate was utilized for coagulation and flocculation in the past but the facility discontinued using this chemical in January 2005. Instead, polyaluminum hydroxychloride is now used at a low dosage because it is more efficient and cost-effective (personal communication with Tim Reiter on January 24, 2007).

Based on the amount of turbidity, number of hours on the filters, or head loss, filters are backwashed for about twenty (20) minutes with chlorinated water (finished drinking water) about once a week in the winter and about twice a week in the summer. Backwash water is discharged to the 1.5 acre settling pond where suspended solids settle out. Settled backwash water is discharged to the Yellowstone River at Outfall 001. The amount of filter backwash water discharged to the settling pond is about 1% of the total volume of raw water treated. The discharge to the river is controlled and occurs for one or two days, two to three times each month. The capacity of the pump at the settling pond limits the discharge flow rate. The pump capacity in the previous permit was 0.16 mgd or 111 gallons per minute (gpm). The pump capacity that will be used in this permit is 0.288 mgd (design flow) or 200 gpm. The increased design flow is discussed in Part III. B. of this Statement of Basis (SOB).

B. Effluent Characteristics

Table 1 summarizes monthly self-monitoring effluent data reported by the City of Laurel WTP during the period of record (POR) January 2000 through June 2006.

Table 1: Effluent Characteristics ⁽¹⁾ for the Period January 2000 through June 2006.

Parameter	Location	Units	Previous Permit Limit	Minimum Value	Maximum Value	Average Value	Number of Samples
Flow, Daily Average	Effluent	MGD	⁽¹⁾	0.288	0.288	0.288	75
Total Suspended Solids (TSS)	Effluent	mg/L	30/45 ⁽²⁾	<1	17	6.6	74
TSS	Effluent	lbs/day	40	<1	40.8	15.6	74
Dissolved Aluminum	Effluent	mg/L	1.0/1.5 ⁽²⁾	0.06	3.4	0.55	72
Dissolved Aluminum	Effluent	lbs/day	1.3	0.24	8.2	1.3	72
Turbidity	Effluent	NTU	⁽¹⁾	0.75	14.5	3.8	74
pH	Effluent	s.u.	6.0-9.0	6.7	8.7	--	76
Chlorine, Total Residual	Effluent	mg/L	0.5 ⁽³⁾	0.01	0.23	0.06	76

Footnotes:

(1) No limit in previous permit; monitoring requirement only

(2) 30-Day Average/Instantaneous Maximum

(3) Instantaneous maximum

C. Compliance History

An inspection of the facility on May 20, 2002 indicated it was not properly maintaining laboratory records as required by the permit. A violation letter was sent to the facility on November 18, 2002. The facility also received a violation letter in 2002 for exceeding the dissolved aluminum limit. No other violation letters are noted in the facility file.

III. Rationale for Proposed Technology-Based Effluent Limits

A. Scope and Authority

The Montana Board of Environmental Review (BER) has adopted performance standards for point source discharges to state waters, under Title 17, Chapter 30, Subchapter 12. The Board has adopted by reference 40 CFR Subpart N which is a series of federal agency rules that adopt technology based effluent limits (TBEL) for existing sources and performance standards for new sources [Administrative Rules of Montana (ARM) 17.30.1207(1)]. National Effluent Limit Guidelines (ELG) have not been promulgated under Subchapter N for filter backwash water at potable water treatment plants.

In addition to Subchapter 12, the BER has adopted general treatment requirements that establish the degree of wastewater treatment required to maintain and restore the quality of state surface waters. This rule states that in addition to federal ELGs, the degree of wastewater treatment is based on the surface water quality standards; the state's nondegradation policy; the quality and flow of the receiving water; the quantity and quality of sewage, industrial wastes and other wastes to be treated; and the presence or

absence of other sources of pollution on the watershed [ARM 17.30.635(1)]. Also, ARM 17.30 635(3) states industrial waste must receive, as a minimum, treatment equivalent to the best practicable control technology currently available (BPCTCA) as defined in 40 CFR Chapter 1, Subchapter N (July 1, 1991).

In the absence of federal effluent limitation guidelines the Department will maintain the TBEL from the previous permit:

Monthly Average TSS: 30 mg/L
Daily Maximum TSS: 45 mg/L

B. Technology-based Effluent Limits – Basis for Mass-Based Calculations

The Laurel WTP has proposed a change in design flow with this permit renewal. The design flow in the previous permit was 0.016 mgd. This permit will use a design flow of 0.288 mgd, which is the maximum capacity of the pump that pumps treated effluent from the settling pond to the Yellowstone River. Loading limits for the technology-based parameter of concern (TSS) will apply to the effluent and will be maintained at the more stringent of the nondegradation allocation or mass-based loading limit calculated in this permit renewal. An adjustment of the TSS concentration limit to reflect the applicable loading limit will assure the effluent load is kept below the nondegradation load allocation and will eliminate the need for a nonsignificance determination (see Section VII).

The following equation was utilized to calculate the mass-based load allocation using the design flow of 0.288 mgd:

Design Flow (mgd) x Concentration Limit (mg/L) x 8.34 (lb·L)/(mg·gal) = Load (lb/day)

TSS:

Average monthly load (lb/day) = (0.288)(30)(8.34) = 72 lb/day

Daily maximum load (lb/day) = (0.288)(45)(8.34) = 108 lb/day

These loads are compared to the nondegradation loads which were calculated in the previous permit cycle at the permitted design flow of 0.016 mgd.

TSS:

Average monthly load (lb/day) = (0.16)(30)(8.34) = 40 lb/day

Daily maximum load (lb/day) = (0.16)(45)(8.34) = 60 lb/day

The TSS mass-based loads using the design flow of 0.288 mgd are greater than the nondegradation allocations so the TSS average monthly and maximum daily limits will be based on the nondegradation loads in the previous permit. The TSS concentration limit is recalculated, using the following equation, to meet these load allocations.

$$\text{Concentration Limit (mg/L)} = \frac{\text{Applicable Load Limit (lb/day)}}{\text{Design Flow (mgd)} \times 8.34 \text{ (lb}\cdot\text{L)/(mg}\cdot\text{gal)}}$$

TSS:

$$\text{TSS Average Monthly Concentration Limit} = \frac{40(\text{lb/day})}{0.288 \text{ mgd} \times 8.34 \text{ (lb}\cdot\text{L)/(mg}\cdot\text{gal)}} = 17 \text{ mg/L}$$

$$\text{TSS Maximum Daily Concentration Limit} = \frac{60(\text{lb/day})}{0.288 \text{ mgd} \times 8.34 \text{ (lb}\cdot\text{L)/(mg}\cdot\text{gal)}} = 25 \text{ mg/L}$$

Proposed TBELs are in Table 2.

Table 2. Technology-based Effluent Limits

Parameter (mg/L)	Concentration		Load		Rationale
	Average Monthly ¹ (mg/L)	Daily Maximum ¹ (mg/L)	Average Monthly (lbs/day)	Daily Maximum (lbs/day)	
TSS	17	25	40	60	BPCTCA/ 75-5-301(1), MCA
(1) See the definitions in Part I.A of the permit for explanation of terms.					

C. Nondegradation Load Allocations

The provisions of ARM 17.30.701, *et seq.* (Nondegradation of Water Quality) apply to new or increased sources of pollution [ARM 17.30.702(18)]. Sources that are in compliance with the conditions of their permit and do not exceed the limits established in the permit, or as determined from a permit previously issued by the Department, are not considered new or increased sources. In the previous Statement of Basis (SOB), the Department calculated mass-based load values (Table 3) for TSS and Dissolved Aluminum (Nondegradation Threshold Values, April 25, 1995) based on a design flow of 0.16 mgd. Since TBELs for TSS in Table 2 have been reduced proportionately to the increased design flow of 0.288 mgd and the nondegradation loads in Table 3 will remain in the renewal permit, the discharge is not subject to the provisions of the Nondegradation Policy (75-5-303, MCA). [Reduced concentration limits for dissolved aluminum based on the increased discharge flow and water quality based effluent limits (WQBEL) are discussed in Section IV.E.3.] Based on this analysis, the discharge does not constitute a new or increased source for the purposes of Montana Nondegradation requirements.

Table 3. Comparison of Actual and Allocated Loads

Parameter	Allocated Load (lbs/day)	Actual Load (lbs/day)				
		2000	2001	2002	2003	2004
TSS	40	31.2	15.3	15.8	21.6	12.6
Dissolved Aluminum	1.3	10.9	1.3	1.5	1.1	1.0

IV. Rationale for Proposed Water Quality-based Effluent Limits

A. Scope and Authority

Permits are required to include WQBELs when TBELs are not adequate to protect state water quality standards (40 CFR 122.44 and ARM 17.30.1344). ARM 17.30.637(2) states that no wastes may be discharged that can reasonably be expected to violate any state water quality standard. Montana water quality standards (ARM 17.30.601 *et seq.*) define both water use classifications for all state waters and numeric and narrative standards that protect those designated uses. New sources, as defined in ARM 17.30.703(16), are subject to Montana Nondegradation Policy [75-5-303, Montana Code Annotated (MCA)] and regulations (ARM 17.30.701 *et. seq.*).

B. Receiving Water

Wastewater is discharged from the Laurel WTP to the Yellowstone River. The receiving water is classified as B-2 according to Montana Water Use Classifications, ARM 17.30.611(1)(b), (upstream of the Laurel WTP intake is classified as B-1 water). B-2 waters are to be maintained suitable for drinking, culinary and food processing purposes, after conventional treatment; bathing, swimming and recreation; growth and propagation of non-salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply. The B-2 classification is consistent with the previous SOB. The Yellowstone River in the vicinity of the discharge is considered high quality water pursuant to Montana's Nondegradation Policy and degradation of high quality water is not allowed unless authorized by the Department under 75-5-303(3), MCA.

The Yellowstone River is located within the upper Yellowstone watershed as identified on United States Geological Survey (USGS) Hydrological Unit Code (HUC) 10070004 and Montana stream segment MT43F001_011. The Yellowstone River in the vicinity of the discharge is on the 1996 303(d) list of impaired streams as impaired for unionized ammonia, salinity, total dissolved solids, chlorides and suspended solids. The probable sources of impairment are agriculture, industrial point sources, irrigated crop production, municipal point sources and natural sources. The Yellowstone River is on the 2006 303(d) list of impaired streams as impaired for chlorophyll-a, unknown impairments, nitrate/nitrite, other anthropogenic substrate alterations and physical substrate habitat alterations. The probable sources of impairment are crop production, channelization, municipal point source discharges and stream bank modifications/destabilization.

To estimate flow in the Yellowstone River at the point of discharge, the flow of the Clarks Fork Yellowstone River that enters the Yellowstone River one mile downstream from the City of Laurel WTP discharge will be subtracted from the flow of the Yellowstone River at Billings. The USGS collects flow and other data for the Yellowstone River at gauging station number 06214500 in Billings, which is about 14 miles downstream from the City of Laurel WTP. The 7Q10 flow at this station is 1,110 cubic feet per second (csf). The USGS gauging station at Silesia (06208800), which is about 12 miles upstream from the Yellowstone River, measures the flow of the Clarks Fork Yellowstone River. The flow at this gauging station is 166 cfs. The difference between these two flow values (944 cfs) is the flow of the Yellowstone River at Laurel that will be used for calculating effluent limits.

C. Applicable Water Quality Standards

Discharges to surface waters classified B-2 are subject to the specific water quality standards of ARM 17.30.624 (March 31, 2006), Department Circular DEQ-7 (February 2006), as well as the general provision of ARM 17.30.635 through 637. In addition to these standards, dischargers are also subject to ARM 17.30 Subchapter 5 (Mixing Zones, November 2004) and Subchapter 7 (Nondegradation of Water Quality, June 30, 2004).

ARM 17.30.635(4) requires that the design condition for disposal systems must be based on the 7-day average flow of the receiving water which is expected to occur on average once in 10-years (7Q10).

D. Mixing Zone

A mixing zone is an area where the effluent mixes with the receiving water and certain water quality standards may be exceeded [ARM 17.30.502(6)]. The Department must determine the applicability of currently granted mixing zones [ARM 17.30.505(1)]. Mixing zones allowed under a permit issued prior to April 29, 1993 will remain in effect unless there is evidence that previously allowed mixing zones will impair existing or anticipated uses [ARM 17.30.505(1)(c)].

A standard mixing zone may be granted for facilities which discharge less than 1 mgd to a stream segment with a dilution ratio greater than or equal to 100:1. The dilution ratio of the Laurel WTP discharge with the Yellowstone River is 2,098:1 (944 cfs/0.45 cfs). Therefore, the entire 7Q10 is used to calculate chronic effluent limits [ARM 17.30.516(a)]. No dilution is allowed to calculate acute effluent limits because acute standards for aquatic life for any parameter may not be exceeded in any portion of a mixing zone and there is no documentation that there is adequate mixing of the discharge with the receiving stream [ARM 17.30.507(1)(b)].

The previous permit identifies a standard mixing zone for the facility that consists of a segment of the Yellowstone River from the discharge point downstream for one mile (10

stream widths). This mixing zone will remain in the renewed permit [ARM 17.30.505(1)(c)].

E. Basis and Calculations for WQBEL (Reasonable Potential)

Pollutants typically present at potable water treatment plants that may cause or contribute to a violation of water quality standards include conventional pollutants such as TSS and pH, non-conventional pollutants such as turbidity, and toxics such as chlorine and aluminum.

Effluent limits are required for all pollutants which demonstrate a reasonable potential to exceed numeric or narrative standards. The Department uses a mass balance equation to determine reasonable potential based on *EPA Technical Support Document for Water Quality-based Toxics Control (TSD) (EPA/505/2-90-001)*. Input parameters are based on receiving water concentration; maximum projected effluent concentration and design flow of the wastewater treatment facility, and the applicable receiving water flow.

No information or data is available for the Yellowstone River immediately upstream from the facility. Therefore, reasonable potential to exceed numeric standards cannot be assessed for this permit. However, maximum discharge values for dissolved aluminum, total residual chlorine and turbidity in Table 2 exceed water quality standards at the discharge pipe for these parameters and because adequate mixing of the discharge with the receiving stream is not documented, effluent limits are required.

1. Conventional Pollutants

Total Suspended Solids - The facility provides a significant reduction in TSS using coagulation/flocculation chemicals and the settling pond. TBELs in Part III of this SOB are sufficient to reduce the suspended solids and will apply to the discharge. No additional WQBEL will be required for this parameter.

2. Non-conventional Pollutants

Turbidity - There is no turbidity limit in the previous permit. The maximum increase above naturally occurring turbidity in this permit is 10 nephelometric turbidity units (NTU) [ARM 17.30.624(2)(d)]. TSS limits are adequate to control turbidity. No additional effluent limit or monitoring is necessary.

3. Toxic Pollutants

Total Residual Chlorine (TRC) - The maximum TRC concentration in Table 1 exceeds the acute water quality standard for TRC and there is no data or mixing zone study to demonstrate the proposed discharge structure will provide adequate mixing of the effluent with the receiving water. In fact, the discharge pipe at the bank would create a shore-hugging plume in which acute toxicity may be present. To ensure acute toxicity

does not occur, water quality standards for chlorine must be met at the end of the discharge pipe (the actual compliance sample will be obtained in the settling pond before the discharge enters the discharge pipe because during high water the end of the discharge pipe is inaccessible).

The TRC limit in the previous permit is 0.5 mg/l. This concentration exceeds the acute water quality standard of 0.019 mg/L and the chronic water quality standard of 0.011 mg/L. The TRC daily maximum limit in this permit is 0.019 mg/l; the TRC average monthly limit is 0.011 mg/L. Analytical methods in 40 CFR Part 136 requires chlorine samples to be analyzed immediately. On-site sampling for total residual chlorine with a chlorine meter using an approved method is required. The method must achieve a minimum detection level of 0.1 mg/l. Sampling of effluent with analytical results less than 0.1 mg/l is considered in compliance with the chlorine limit.

Dissolved Aluminum (Al) - The maximum dissolved aluminum concentration in Table 1 exceeds the acute water quality standard for aluminum and there is no data or mixing zone study to demonstrate the proposed discharge structure will provide adequate mixing of the effluent with the receiving water. As stated above, the discharge pipe at the bank will create a shore-hugging plume in which acute toxicity may be present.

Dissolved aluminum effluent limits have been included in past permits. The previous dissolved aluminum effluent limits were 1.0 and 1.5 mg/L for the 30-day and daily maximum limits, respectively.

Dissolved aluminum is a toxic parameter (DEQ-7, February 2006) and limits are applicable to surface waters with a pH between 6.5 and 9.0 s.u. The acute standard is 0.750 mg/L and the chronic standard is 0.087 mg/L. These water quality standards will be the effluent limits applicable to the sample obtained in the settling pond before the discharge pipe (because the end of the discharge pipe is inaccessible during high water).

The following equation was utilized to calculate the mass-based load allocations for aluminum using the proposed design flow of 0.288 mgd and proposed effluent limits.

Design Flow (mgd) x Concentration Limit (mg/L) x 8.34 (lb·L)(mg·gal) = Load (lb/day)

Dissolved Aluminum

Average monthly load (lb/day) = (0.288)(0.087)(8.34) = 0.2 lb/day

Maximum daily load (lb/day) = (0.288)(0.75)(8.34) = 1.8 lb/day

V. Proposed Effluent Limits

A. Interim Effluent Limits for Outfall 001

Interim effluent limits for Outfall 001 in Table 4 are effective for three (3) years after the effective date of the permit, after which time final effluent limits in Table 5 apply.

Table 4. Interim Effluent Limits – Outfall 001

Parameter	Units	Average Monthly Limit ¹	Maximum Daily Limit ¹
Dissolved Aluminum	mg/L	1.0	1.5
	lbs/day	--	--
Total Suspended Solids (TSS)	mg/L	30	45
	lbs/day	40	60
Total Residual Chlorine ²	mg/L	--	0.5
Footnotes:			
1. See Definition section at end of permit for explanation of terms.			
2. Sampling of effluent with analytical results less than 0.1 mg/L is considered in compliance with the chlorine limit.			

Effluent pH shall remain between 6.0 and 9.0. For compliance purposes, any single analysis and/or measurement beyond this limitation shall be considered a violation of the conditions of this permit [ARM 17.30 647(2)(c)].

There shall be no discharge of floating solids or visible foam in other than trace amounts [ARM 17.30 647(1)(b)].

There shall be no discharge which causes visible oil sheen in the receiving water [ARM 17.30 647(1)(b)].

B. Final Effluent Limits for Outfall 001

Final effluent limits for Outfall 001 in Table 5 are effective three (3) years after the effective date of the permit.

Table 5. Final Effluent Limits – Outfall 001

Parameter	Units	Average Monthly Limit ¹	Maximum Daily Limit ¹
Dissolved Aluminum	mg/L	0.087	0.75
	lbs/day	0.2	1.8
Total Suspended Solids (TSS)	mg/L	17	25
	lbs/day	40	60
Total Residual Chlorine ²	mg/L	0.011	0.019
Footnotes: NA - Not applicable 1. See Definition section at end of permit for explanation of terms. 2. Sampling of effluent with analytical results less than 0.1 mg/L is considered in compliance with the chlorine limit.			

Effluent pH shall remain between 6.0 and 9.0. For compliance purposes, any single analysis and/or measurement beyond this limitation shall be considered a violation of the conditions of this permit [ARM 17.30 647(2)(c)].

There shall be no discharge of floating solids or visible foam in other than trace amounts [ARM 17.30 647(1)(b)].

There shall be no discharge which causes visible oil sheen in the receiving water [ARM 17.30 647(1)(b)].

VI. Monitoring Requirements

A. Effluent Monitoring

Monitoring of the effluent must be representative of the discharge. The effluent sample must be obtained from the settling pond before the discharge pipe because during high water the end of the discharge pipe is inaccessible.

Monitoring Requirements				
Parameter	Unit	Monitoring Location	Frequency of Analyses	Sample Type ¹
Flow	mgd	Effluent	Continuous ²	Pump capacity
Duration	days	Effluent	Reported	None
TSS	mg/L	Effluent	1/Week	Grab
	lbs/day	Effluent	1/Month	Calculated
Dissolved Aluminum	mg/L	Effluent	1/Week	Grab
	lbs/day	Effluent	1/Month	Calculated
pH	s.u.	Effluent	1/Week	Instantaneous
Total Residual Chlorine	mg/L	Effluent	Daily	Grab
Footnotes:				
1. See Definition section at end of permit for explanation of terms.				
2. Based on capacity of effluent discharge pump (0.288 mgd).				

C. Additional Reporting Requirements

Load calculations are required. Standard language with examples of load calculations and percent removal calculations will be included in the permit.

Analytical methods in 40 CFR Part 136 requires TRC samples to be analyzed immediately. On-site sampling for TRC with a chlorine meter using an approved method is required. The method must achieve a minimum detection level of 0.1 mg/L. Effluent samples with analytical results less than 0.1 mg/L is considered in compliance with the TRC limit.

VII. Nonsignificance Determination

TSS and dissolved aluminum concentrations have been reduced proportionately to the increased design flow of 0.288 mgd in this permit and the nondegradation loads in Table 3 will remain in the renewal permit so the discharge from the Laurel WTP does not constitute a new or increased source of pollutants pursuant to ARM 17.30.702(18). Therefore, the discharge is not significant.

VIII. Special Conditions/Compliance Schedules

There are no special conditions or compliance schedule necessary for this permit.

IX. Other Information

On September 21, 2000, a U.S. District Judge issued an order stating that until all necessary total maximum daily loads (TMDLs) under Section 303(d) of the Clean Water Act are established for a particular water quality limited segment (WQLS), the State is not to issue any new or increased permits under the MPDES program. The order was issued in the

lawsuit Friends of the Wild Swan v. U.S. EPA, et al. (CV 97-35-M-DWM), District of Montana and Missoula Division. The DEQ finds that renewal of this permit does not conflict with the order because there are no new or increased sources associated with the discharge.

X. Information Source

ARM Title 17, Chapter 30, Subchapter 5 - Mixing Zones in Surface and Ground Water. November 2004.

ARM Title 17, Chapter 30, Subchapter 6 - Surface Water Quality Standards. March 31, 2006.

ARM Title 17, Chapter 30, Subchapter 7 - Nondegradation of Water Quality. June 30, 2004.

ARM Title 17, Chapter 30, Subchapter 13 - Montana Pollutant Discharge Elimination System (MPDES) Standards. March 31, 2003.

40 CFR, Parts 122, 133, 136, July 1, 2004.

DEQ. Circular WQB-7, Montana Numeric Water Quality Standards. February 2006.

DEQ. Montana List of Water bodies in Need of Total Maximum Daily Load Development. 1996.

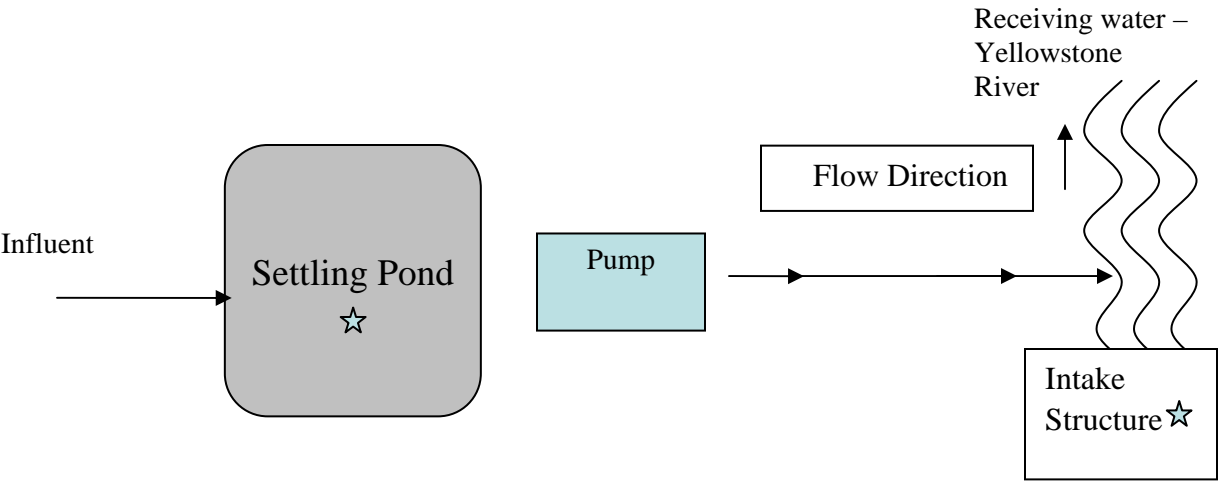
DEQ. Montana 303(d) List. A Compilation of Impaired and Threatened Water bodies in Need of Water Quality Restoration. Part A. Water Quality Assessment Results. November 24, 2006.

EPA. Office of Water, U.S. EPA NPDES Permit Writers' Manual, EPA-833-B-96-003. December 1996.

EPA. Technical Support Document for Water Quality based Toxics Control EPA/505/2-90-001. March 1991.

Prepared by: John Wadhams
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Figure 1



☆ Sample location